

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

24 (new). In a data processing network having a production site, first and second remote sites, a first communications link between the production and first remote site and a communication link between the first and second remote sites wherein the production site includes a magnetic disk storage device and a host adapted to update the data in the magnetic disk storage device, wherein the first remote site includes a first data store that mirrors the data in the magnetic disk storage device, a second data store that operates in a first mode to mirror the data on the first data store and a copy program and wherein the second remote site includes another data store, the data processing network being characterized by a method for providing a backup of the data at the production site in each of the first and second remote sites by:

- A) establishing in the first remote site first and second tables for recording the occurrence of any change in the data in first data store and a third table for recording the need for any transfer of data from the second data store to the data store in the second remote site,
- B) initially establishing a state whereby the data in the data store in the second remote site

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

corresponds to the data in the first data store at a point in time,

- C) reestablishing the first operating mode for the second data store by combining information in the first and third tables to identify the changes made to the first data store while the second data store was operating in the second operating mode, and
- D) differentially splitting, after synchronism is achieved between the first and second data stores, the second data store from the first data store by:
 - i) copying the information in the second table to the third table,
 - ii) clearing the second table, and
 - iii) enabling the copy program to transfer the changed data in the second data store to the data store in the second remote site whereby the data store in the second remote site is brought into synchronism with the data that existed in the first data store at the time of said differential splitting.

25 (new). A method as recited in claim 24 wherein said initial establishment includes:

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

- i) establishing a first operating mode for the second data store whereby the second data store is brought into synchronism with the first data store,
- ii) splitting to shift the second data store to a second operating mode after synchronism is achieved during which
 - a) the copy program copies data from the second data store to the data store in the second remote site in response to the information in the third table, and
 - b) the first and second tables are updated each time the data in the first data store is altered.

26 (new). A method as recited in claim 25 wherein the host generates a first command to initiate said reestablishment step and a second command to initiate said differential splitting and wherein the method includes conveying the first and second commands to the first remote site on an iterative basis for effecting a cascading session during which the first and second operating modes are processed on a mutually exclusive basis.

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

- 27 (new). A method as recited in claim 25 wherein the magnetic disk storage devices have data storage tracks and wherein said copying occurs on a track-by-track basis, each of the first, second and third tables being formed as track tables with one bit position corresponding to one track.
- 28 (new). A method as recited in claim 27 wherein the first data store includes storage for diverse information about each track, said method including the step of copying the diverse information to the second table.
- 29 (new). A method as recited in claim 28 wherein the host generates a first command to initiate said establishment step, a second command to initiate said splitting operation and then issues a third and fourth commands iteratively and on a mutually exclusive basis, the third command initiating the reestablishment step and the fourth command initiating differential splitting whereby the commands effect a cascading session.
- 30 (new). A data processing network having a production site, first and second remote sites, a first communications link between the production and first remote site and a communication link between the first and second remote

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

sites wherein the production site includes a magnetic disk storage device and a host adapted to update the data in the magnetic disk storage device, wherein the first remote site includes a first data store that mirrors the data in the magnetic disk storage device, a second data store that operates in a first mode to mirror the data on the first data store and a copy program and wherein the second remote site includes another data store, the data processing network including means for providing a backup of the data at the production site in each of the first and second remote sites comprising:

- A) table means for establishing in the first remote site first and second tables for recording the occurrence of any change in the data in first data store and a third table for recording the need for any transfer of data from the second data store to the data store in the second remote site,
- B) initial establishing means for initially establishing a state whereby the data in the data store in the second remote site corresponds to the data in the first data store at a point in time,
- C) reestablishment means for reestablishing the first operating mode for the second data store

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

- by combining information in said first and third tables to identify the changes made to the first data store while the second data store was operating in the second operating mode, and
- D) differential split means for differentially splitting, after synchronism is achieved between the first and second data stores, the second data store from the first data store including:
- i) copy means for copying the information in said second table to said third table,
 - ii) clearing means for clearing said second table, and
 - iii) enabling means for enabling said copy program to transfer the changed data in the second data store to the data store in the second remote site whereby the data store in the second remote site is brought into synchronism with the data that existed in the first data store at the time said differential splitting means operated.

31 (new). A data processing network as recited in claim 30 wherein said initial establishment means includes:

- i) first mode means for establishing a first operating mode for the second data store

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

- whereby the second data store is brought into synchronism with the first data store,
- ii) second mode means for shifting the second data store to a second operating mode after synchronism is achieved whereby said copy program copies data from the second data store to the data store in the second remote site in response to the information in said third table, and
 - iii) updating means for updating said first and second tables each time the data in the first data store is altered.

32. (new). A data processing network as recited in claim 31 wherein the host generates a first command activates said reestablishment means and a second command activates said differential splitting means, said network including means for conveying the first and second commands to the first remote site on an iterative basis for effecting a cascading session during which the first and second operating modes are processed on a mutually exclusive basis.

33 (new). A data processing network as recited in claim 31 wherein the magnetic disk storage devices have data

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

storage tracks and wherein said copying means processes data on a track-by-track basis, each of said first, second and third tables being formed as track tables with one bit position corresponding to one track.

34 (new). A data processing network as recited in claim 33 wherein the first data store includes storage for diverse information about each track and said first remote site includes means for copying the diverse information to said second table.

35 (new). A data processing network as recited in claim 34 wherein the host generates a first command to activate said establishment means, a second command to activate said splitting means and then generates third and fourth commands iteratively and on a mutually exclusive basis, the third command activating said reestablishment means and the fourth command activating said differential splitting means whereby the commands effect a cascading session.

36 (new). A data processing network having a production site, first and second remote sites, a first communications link between the production and first remote site and a communication link between the first and

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

second remote sites wherein the production site includes a magnetic disk storage device and a host adapted to update the data in the magnetic disk storage device, wherein the first remote site includes a first data store that mirrors the data in the magnetic disk storage device, a second data store that operates in a first mode to mirror the data on the first data store and a copy program and wherein the second remote site includes another data store, the data processing network including a program at the first remote site for providing a backup of the data at the production site in each of the first and second remote sites comprising:

- A) a configuration program module in a service processor at the first remote site for establishing first and second tables for recording the occurrence of any change in the data in first data store and a third table for recording the need for any transfer of data from the second data store to the data store in the second remote site,
- B) an establish program module for initially establishing a state whereby the data in the data store in the second remote site corresponds to the data in the first data store at a point in time,

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

- C) a reestablish program module for reestablishing the first operating mode for the second data store by combining information in said first and third tables to identify the changes made to the first data store while the second data store was operating in the second operating mode, and
 - D) a differential split program module for differentially splitting, after synchronism is achieved between the first and second data stores, the second data store from the first data store including:
 - i) copying the information in said second table to said third table,
 - ii) clearing said second table, and
 - iii) enabling said copy program to transfer the changed data in the second data store to the data store in the second remote site whereby the data store in the second remote site is brought into synchronism with the data that existed in the first data store at the time said differential splitting.
- 37 (new). A program as recited in claim 36 wherein said initial establishment module includes:
- i) an establishment module for establishing a first operating mode for the second data

Applicant(s): Mathieu Gagne and Yuval Ofek
Serial No.: 10/752,256
Filed: January 6, 2004

E30-029CON2

store whereby the second data store is brought into synchronism with the first data store, and

- ii) a split module for shifting the second data store to a second operating mode after synchronism is achieved during which
 - a) the copy program copies all of the data from the second data store to the data store in the second remote site in response to the information in the third table, and
 - b) the first and second tables are updated each time the data in the first data store is altered.

38 (new). A program as recited in claim 37 wherein the host generates a first command to activate said reestablishment module and a second command to activate said differential splitting module and wherein the program conveys the first and second commands to the first remote site on an iterative basis for effecting a cascading session during which the first and second operating modes are processed on a mutually exclusive basis.

Applicant(s): Mathieu Gagne and Yuval Ofek E30-029CON2
Serial No.: 10/752,256
Filed: January 6, 2004

39 (new). A program as recited in claim 37 wherein the magnetic disk storage devices have data storage tracks and wherein said copying occurs on a track-by-track basis, each of the first, second and third tables being formed as track tables with one bit position corresponding to one track.

40 (new). A program as recited in claim 39 wherein the first data store includes storage for diverse information about each track, said program copying the diverse information to the second table.

41 (new). A program as recited in claim 40 wherein the host generates a first command to activate said establishment module, a second command to activate said splitting module and third and fourth commands iteratively and on a mutually exclusive basis, the third command activating the reestablishment module and the fourth command activating said differential splitting whereby the repeated processing of the third and fourth commands effect a cascading session.